

A revision of *Corydalis* sect. *Fumariooides* Liden: part II

Magnus Liden

Department of Systematic Botany, Carl Skottsbergs gata 22
S-413 19 Goteborg, Sweden

Abstract

The species of *Corydalis* sect. *Fumariooides* are described, illustrated, and mapped. Four species and three subspecies are recognized for the first time: *C. diffusa*, *C. pseudotangolensis*, *C. rostellata*, *C. zhongdianensis*, *C. sibirica* ssp. *elevata*, *C. casimiriana* ssp. *brachycarpa*, and *C. rubrisepala* ssp. *zhuangiana*, taking the total number of species in the section to 25.

This paper is a continuation of "A revision of *Corydalis* sect. *Fumariooides* part I" (Liden 1991), in which the section was described and provided with a synopsis of the species, a key, and descriptions of new taxa. Since then I have had the opportunity (1991) to go through the huge collections in Kunming, which at that time included a lot of material on loan from other Chinese herbaria, and also to study further taxa in the field in NW Yunnan in 1993. Two species were detected in the herbarium material, and one (*C. rostellata*) was collected for the first time in Deqin (Atuntze) in NW Yunnan. A fourth (*C. zhongdianensis*) had already been annotated by Dr. Su Zhi-Yun from the Kunming Botanical Institute, and was again found during the expedition. Much new information could also be added concerning the distribution of several taxa, and proper synonymization of some names could be carried out.

MATERIAL AND METHODS

This revision is based on herbarium material, field studies, and plants cultivated in greenhouse. Measurements are based on fresh or resoftened flowers, but properly dried specimens show little distortion. All cited specimens, including types, have been seen, unless otherwise indicated. The distribution maps cover specimens seen by me, unless otherwise stated. For Nepalese records the reader is referred to Liden (1989).

RELATIONSHIPS AND SUBDIVISION

The subdivision of the genus *Corydalis* as outlined in Liden (1986) is far from complete, and it is clear that several more sections need to be

Magnus Liden

described. In that treatment, following Fedde (1936), several groups were provisionally lumped together in *Ramoso-sibiricae* Fedde, but it is now clear that these are a polyphyletic assemblage, united only by their branched leafy stems and exploding capsules. Both characters occur in several other sections. Among present and potential segregates, the sect. *Fumariooides* is one of the more easily circumscribed. A sister-group cannot be definitely secured at present, but some characters are shared with the sect. *Davidianae* (ined.), a small group of East Himalayan and Chinese species. *Corydalis* sect. *Fumariooides* can be divided into two apparently natural subsections (*Radicosa* Liden and *Fumariooides*, but see *C. pseudodrakeana*). The subsections *Fumariooides* is here divided into four series. The series *Tuberculata* Liden (based mainly on the conspicuous autapomorphy of tuberculate seeds) is reduced to synonymy under series *Fumariooides*. Their very close relation is undisputable, and the newly discovered *C. rostellata* could probably not be placed in either series, without rendering it paraphyletic. The solution to describe a new monotypic series for this species is less satisfactory, and would leave an easily recognizable clade unnamed.

Habitat: The species of section *Fumariooides* are mainly found at subalpine to alpine altitudes (2500-4300 m in the Himalayas, occasionally up to 4900 m in Tibet). The only low-altitude species (i. e. they descend to below 2000 m in the Himalayan region) are *C. longipes*, which is frequent in humid areas of Central Nepal, *C. drepanantha* from E. Bhutan and Arunachal Pradesh and *C. khasiana*. Although the species differ widely in their habitat requirements, most of them are poor competitors in closed vegetation. Most of the Chinese species grow on heavily disturbed soils like roadsides, natural or artificial screes, or in ruderal situations. Others, like the Himalayan *C. calycina* and *C. casimiriana*, are found in alpine pastures, but are well established only in burnt patches or in less demanding micro-habitats created by the activity of grazing and digging animals. *C. lathyroides*, and one form of *C. gracillima* grow on wet mossy cliffs.

Many species (*C. cavei* and *C. longipes* excepted) are probably self-fertile and to a large extent autogamous, at least *C. pseudotongolensis*, *C. rostellata*, *C. sibirica*, *C. gracillima*, *C. calycina*, *C. casimiriana*, and *C. pseudolongipes*. All species in subsect. *Radicosa* and *C. lathyroides* have thick perennial rootstocks. Many species in the subsect. *Fumariooides* appear to be annuals or biennials, but several of them (*C. filiformis*, *C. calycina*, *C. khasiana*, *C. gouldii*, *C. rubrisepala*, *C. longipes*) produce fleshy adventitious roots, and can probably perenniate.

Distribution: The section is most diversified in SE Tibet and adjacent parts of China and Central Himalaya where all supraspecific taxa occur. From this area outliers reach Kashmir, Khasia hills and Central Burma (series

A revision of *Corydalis* sect. *Fumariooides*

Himalayanae), and Siberia (series *Fumariooides*). A clearcut vicariance is present at the species level in all the series. Only *C. casimiriana* has a distribution overlapping that of other species.

Subsect. Radicosa Liden, *Rheeedea* 1: 32. 1991. Type species: *C. crispa* Prain.

Perennials with stout long usually deeply buried rootstock with annual stems arising from its apex. Underground part of stem unbranched, with or without leaves or petiole-remnants; aerial part leafy and branched from the base. Stigma with simple papillae only, i. e. the peculiar "geminata" papillae that are present in most *Corydalis* species are lacking (except in *C. diffusa*).

5 species, SE Tibet and adjacent areas of Sichuan and Yunnan, and Himalaya from E Nepal to Bhutan.

C. crispa. Prain, D., J. Asiat. Soc. Beng. II, 65(2): 30. 1896. Type: Chumbi: at Perm-la, near Chum-la-ri, 29. 7. 1882. selected here: King's coll. (CAL-lecto, BM, K).

C. stracheyoides Fedde, Feddes Report 18: 29. 1922. Type: W Bhutan: Chugya, Tang La on the Gyantse - Phari road ($27^{\circ} 50' N$, $89^{\circ} 11' E$), 1500', Rhomoo Lepcha 279 (BM, E).

C. crispa var. *waltoni* Fedde, Feddes Report. 19: 120. 1923. Type: S Tibet Gyantse, 13200', 1904, H. J. Walton 122 (BM, K, P).

C. bowes-lyonii D. G. Long, Notes RBG Edinb. 42: 99. 1984. Type: Bhutan $27^{\circ} 29' E$, $89^{\circ} 38' E$, 18. 9. 1967, Bowes-Lyon 5120 (E, BM).

C. pseudothyrsiflora C. Y. Wu & H. Zhuang, Fl. Xiz. 2: 310. 1985. (type only). Type: Xizang: Cona, 4740 m, 17. 7. 1975, C. Y. Wu & al. 75-863 (KUN).

C. crispa var. *laeviangula* C. Y. Wu & H. Zhuang, Fl. Xiz. 2: 315. 1985. Type: Xizang: P. K. Hsiao 1682 (KUN).

C. crispa var. *setulosa* C. Y. Wu & H. Zhuang, Fl. Xiz. 2: 317. 1985. Type: Xizang: Nyingchi, Y. T. Chang & K. Y. Lang (PE).

(Fig. 1. Map 1.)

Rootstock robust, long, often branched below, with 1-5 stems from the apex. Stems with a few distant scales on the subterranean portion, producing several leaves and branches at the soil surface, papillose-scabrid on veins and petioles (less so on stems), rarely more densely papillose all over. Aerial stems weak, 10-40 cm, diffusely branched. Leaves stalked, bipinnate, ± triangular, with 3 pinnae and 1(-2) pinnulae, pinnulae ternate with ± divided lobes; ultimate segments obovate, mucronate. Racemes 5-20-flowered (-40 in *Ludlow, Sherriff & Taylor* 5139). Most bracts entire, lanceolate, or the lower and

Magnus Liden

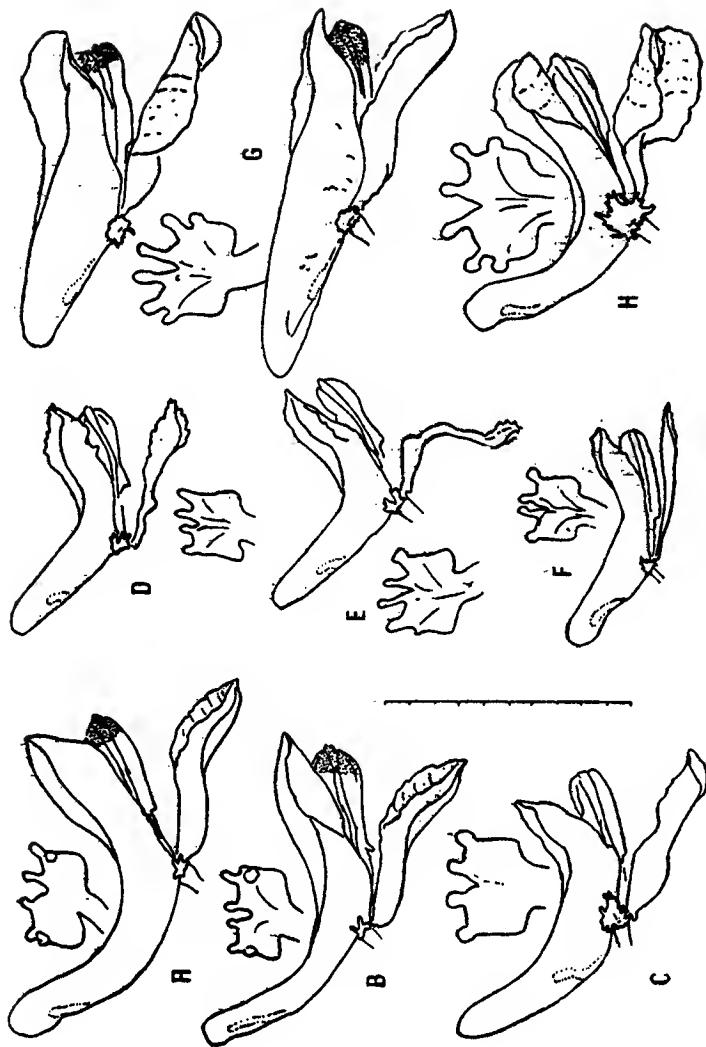


Fig. 1. Flowers and stigmas of subsect. *Radicosa*. A-B) *C. diffusa*, A) type, B) XIZ. DR. HERB. EXP. 72-493. C) *C. drepanantha*, type; D-F) *C. pseudotongolensis*; D) SOULIE 3640. E) Type, F) KGB 583. G) *C. caerulei*, in cultis Göteborg, sine coll. H) *C. crispa*, SINCLAIR & LONG 5417.

A revision of *Corydalis* sect. *Fumariooides*

middle ones more divided (especially in some specimens from E Tibet: Dengen: G. C. Xia 1682, 1850; Lhunzub: Xiz. Dr. Herb. Exp. 1962, PE). Pedicels 5—14 (—23) mm, recurved in fruit. Sepals 1—2 mm, deeply and irregularly dentate. Petals golden yellow, not dark-tipped; outer ones broadly winged obtuse with conspicuous, often irregularly sinuose dorsal crests; spur of upper petal somewhat upwardly curved, 6—9 mm with nectary 2/3 - 3/4 as long; inner petals 6—8 mm. Fruit oblong, sometimes spotted or streaked with blackish purple, with finely and densely papillose ridges, 3—10-seeded, 6—11×2 mm; style 2 mm long; stigma with six simple papillae.

Common in SE Tibet and Bhutan in a wide variety of habitats: "Cliff ledge", "near cult", "disturbed wet scree", "amidst trees and shrubs on flat moist ground", "among rank herbage in grazing ground", 3000—4900 m. July to September.

Used: in Tibet as a remedy for hypertension.

Specimens examined: XIZANG: S Tibet, *Lama Ujen Gyatsko* 325 (CAL); *Ludlow & Sherriff* 9966 (BM); Biru, *D. D. Tao* 11347 (PE, KUN); Chumbi: Syam-po, *King's coll.* 115 (P), at Perm-la, near Chumla-ri' *King's coll.* (CAL-lecto, BM, K); Cona, C. Y. Wu & al. 75—863 (KUN); Damxung, *Ludlow & Sherriff* 11037 (E, BM); Dinggye, G. X. Fu & J. W. Zhang 1031 (PE); Dingqing: G. C. Xia 1682 (KUN), P. K. Hsiao 1682 (KUN); Drebung, *Chapman* 11 (K); Drukla Gompa near Xoka Dzong, *Ludlow, Sherriff & Taylor* 6857 (BM); Gantsa *Gould* 948 (K), Oantsa to Phari, *Gould* 1457 (K); Gokar La, *Bailey* s. n. (E, BM); Gyaca, Xiz. Dr. Herb. Exp. 74—4337 (PE, HNWP); Gyangze: *Walton* 112 (B, K), 122 (BM, K, P); Jomda, P. Q. Zhong 7167 (PE); Kharta Stuha Orpa, *Wayne*, L. R. 244 (K); Lhasa: *Aufschneiter* s. n. (BM), *Guthrie* 20248 (K), *Chapman* 958 (K); *Richardson* 257 (BM, E), Laogong, *Stewart H. M.* s. n. (K); Lhunzub, Xiz. Dr. Herb. Exp. 1962 (PE, HNWP); Namling, Q. Z. Exp. 74—7427 (PE, KUN, HNWP); Nyalam, Pauku, *Veg. Gr.* 4956 (PE - Ec); Nyima La, *Ludlow & Sherriff* 5139 (E, BM); Nyingchi, NiXi, *Zhang & Lang* 1148 (PE); Phari, Goop, *Dungbo* s. n. (K, P); Q. Z. Exp. 74—2893 (PE); Rong Kong, *Shebbeare* (*Mt. Everest Exp.*) 99a (K); Tsang, Uyug Numagang, *Aufschneiter* s. n. (BM); Tsangpo valley, Tse, *Ludlow & Sherriff* 6005 (E, BM); Yadong: Q. Z. exp. 74—2693 (KUN); Data incomplete (recorded in Kunming herbarium): Gesang; Lhasa to Zazba; Gyirong; Jangzhi to Zhogang; Jasaxian; Lhinzi; Maloning; Nongzi; Pani near Pali.

BHUTAN: Timphu: *Sinclair & Long* 55509 (E), Naro, WasaLa, *Bowes Lyon* 5128 (BM); *Bowes-Lyon* 5120 (E, BM); Yele La, *Cooper, R. E.* 1835 (E, BM); upper Bumthang Chu, Champa, Pumthung, *Cooper R. E.* 2183

Magnus Liden

(E); Upper Mangde Chu, *Ludlow, Sherriff & Hicks* 16907 (BM); Lingshi, "Khamlung Bashaka", *Newang & Tshering* s. n. (E); upper Mo Chu, SW Lingshi Dong, *Sinclair & Long* 5417 (E); Chugya, Tang La on the Gyangtse-Phari road *Rhomoo Lepcha* 279 (BM, E).

Corydalis diffusa Liden, spec nov.

(Fig. 1, Map 1.)

Herba perennis caudici elongati angusti. Caules subterranei simplices, supraterrenei ramosi. Folia longe petiolata vaginata; lamina parva triangularis binternata lobis ultimis obovatis. Racemi 10—15-flori, initio densiusculi, in statu fructifero laxiores. Bractae profunde divisae pedicellis brevibus fructiferis reflexis superantes. Sepala parva dentata. Corolla verosimiliter lutea; petala exteriora late alata subobtusa crista integra lata; calcar petalorum superiorum sursum curvatum 7—10 mm longum cylindricum vel apicem versus paulo attenuatum nectario paulo breviore; petala interiora apice atro-purpureo-maculata, 8 mm longa. Petalum inferiourum basin versus in unguem brevem indistinctum attenuatum. Capsula anguste obovoidea. Stigma cum quattuor papillis apicalibus.

Typus: E Tibet: Zuo-la ("Cona Plant"), 4680 m, Wu Zheng Yi 75—885 (KUN).

Perennial with a long slender rootstock. Basal (underground?) part of stem unbranched, often rather long, with remnants of old petioles. Aerial parts of stems 15—40 cm, diffusely branched from the base, 15—40 cm. Leaves rather long-stalked, vaginate at base; lamina small, bi-ternate with obovate ultimate lobes. Racemes 10—15-flowered, rather dense at anthesis, elongating in fruit. Pedicels 8—15 mm, reflexed in fruit. Bracts broadly elliptic-acute, entire or with a few lateral teeth, shorter than pedicels (lower bracts and pedicels sometimes much longer). Sepals 0.5(-1) mm, coarsely dentate. Corolla probably yellow with the inner petals dark purple at apex; outer petals subobtuse to subacute, broadly winged with broad entire median crests; spur of upper petal cylindrical or somewhat tapering towards the apex, slightly curved upwards, 7—10 mm long with nectary slightly shorter; lower petal gradually narrowed into a short, indistinct claw; inner petals 8 mm long. Capsule narrowly obovoid, 10—11 × 2 mm, including a 3—4 mm long sharply set off style 3—8-seeded. Stigma with only four papillae, of which the outermost ones show a tendency to be double.

SE Tibet. 4000—4700 m.

Closely related to *C. crispa*, but distinguished from this species by the dark-tipped inner petals, the smaller leaves, the narrowly obovoid fruit with much longer style, and the rather different stigma.

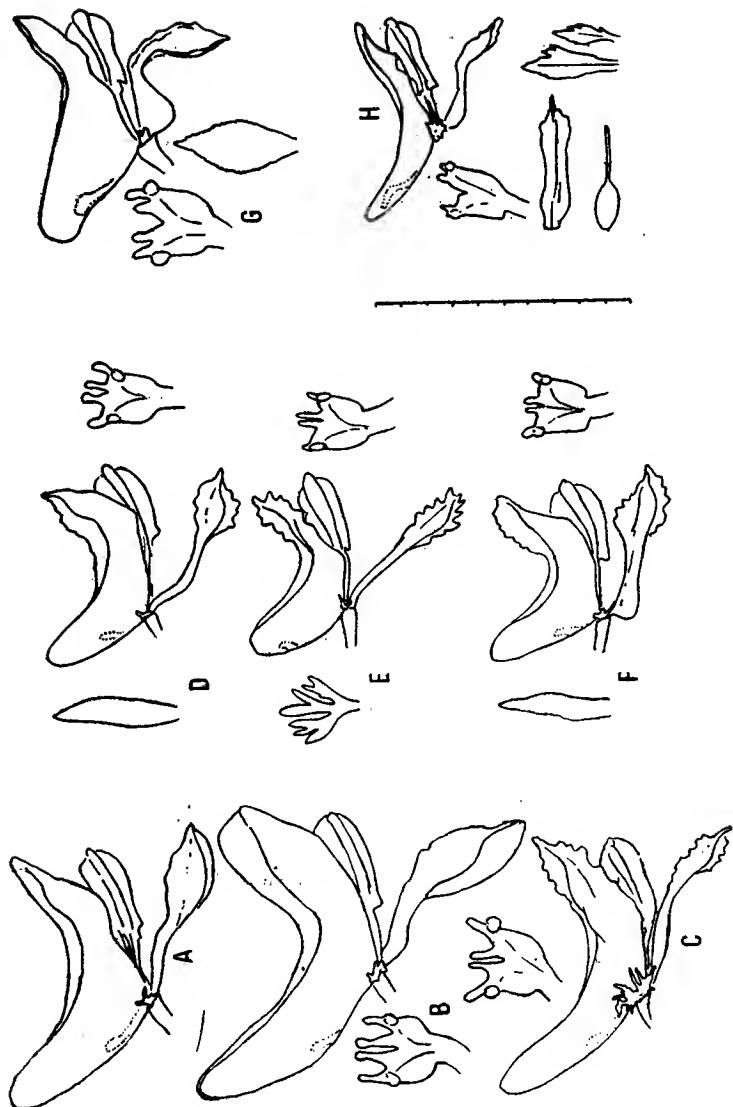
A revision of *Corydalis* sect. *Fumarioides*

Fig. 2. Flowers, stigmas and bracts of series *Fumarioides*. A-B: *C. tongolensis*, A) Forrest 28665. B) Rock 24172. C) *C. yui*, type. D) *C. impatiens*, Irkutsk, ENANDER (UPS). E) *C. pseudoelegans*, type. F) *C. sibiricassp. elata*, type. G) *C. zhongdianensis*, type, H) *C. rostellata*, type.

Magnus Liden

Specimens examined: XIZANG: Cona: *B. Z. Guo & W. Y. Wang* 22788 (KUN, HNWP), 23023 (HNWP), *Wu Zheng Yi* 75—885 (KUN); Nangxian: *Xiz. Dr. Herb. Exp.* 72—493 (PE, HNWP).

- C. cavei* D. G. Long, Notes RBG Edinb. 42: 104. 1984. Type: Sikkim, Phallut, 27° 12' N, 88° 01' E, 3350 m, 1. 9. 1919, *Cave s. n.* (E, holo).
C. papillipes C. Y. Wu, Fl. Xiz. 2: 317. 1985. (type only). Type: Xizang: Nyalam Xizang Medic. Herb. Exp. 1788 (BEI).

(Fig. 1, Map 1.)

Perennial with unbranched underground stems beset with remnants of petiole-bases from a slender to rather stout rootstock. Aerial stems weak and fragile, branched from the base, 15—50 cm, probably sometimes supported by surrounding vegetation. Leaves triangular in outline, twice to three times ternately divided or sub-bipinnate with deeply divided segments, glaucous beneath, green above; ultimate lobes narrowly to broadly obovate, obtuse at apex. Petioles of lower leaves longer than lamina, upper ones shorter. Raceme 5—25-flowered, simple or rarely with a basal branch, rather dense at first, but becoming lax in fruit. Lower bracts leaflike, ones to twice ternate, upper ones entire or dentate, usually shorter than the slender 5—15 mm long pedicels which are downwardly arcuate in fruit. Flowers 16—19 mm long, yellow to orange with the tips of the inner petals purplish black; upper petal with a broad entire crest reaching the apex, and there abruptly terminating, narrowly decurrent on the short (7—9 mm) spur; nectary 1/2—2/3 as long as spur; lower petal rather broad, acute-acuminate, shortly crested. Capsule (immature) linear, 12—15×2 mm, including a 2.5 mm long style, 5—7-seeded, uni-seriate. Stigma with 6 simple papillae.

"Sandy scree", "grassy meadow", 2500-4300 m.
 E Nepal, Sikkim, and S Tibet (see Liden 1989, and above).

- C. drepanantha.* D G. Long, Notes RBG Edinb. 42: 101. 1984.
 Type: India: Arunachal Pradesh: between Pangchen and Le, Nyam Juang Chu (27° 45' 91° 49' E), 2285 m, 4. 4. 1936, *Ludlow & Sheriff* 1272 (BM-holo)

(Fig. 1, Map 1.)

Perennial with rather large scattered papillose emergences on stems and leaves. (Aerial) stems erect, strict, branched from the base, (12—)20—40 cm. Leaves long-stalked with wide and long sheathing petiole-bases; lamina triangular, bi-tri-sub-pinnate to ternate; leaflets deeply cut with narrowly oblong to lanceolate acute lobes. Racemes lax, 5—10-flowered, subsecund. Bracts stalked, cuneate at base, once to twice ternatisect with acute, narrow lobes, or rarely the uppermost bracts, entire. Pedicels shorter or equaling bracts, 3—6 mm, downcurved in fruit. Sepals 0.5 mm, dentate. Corolla yellow; outer

A revision of *Corydalis* sect. *Fumarioides*

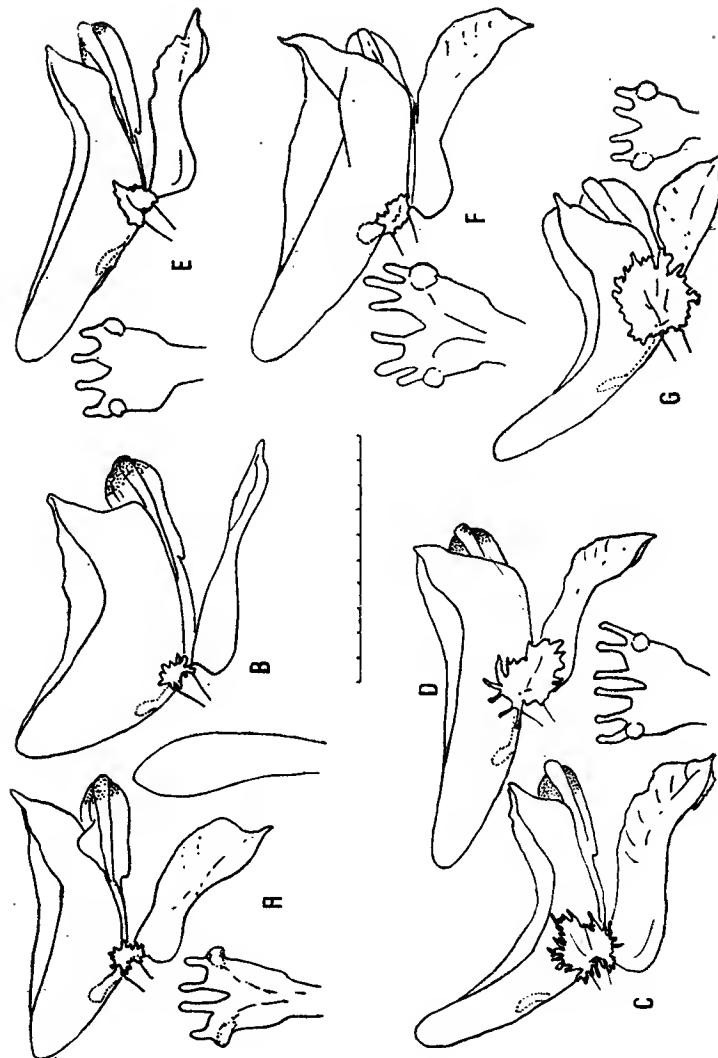


Fig. 3. Flowers and stigmas of series *Himalayanae*. A-B: *C. aconitifoliae*: A) KINGDON WARD & NASLUND s.n., cultivated in Bergianska trädgården, Stockholm. B) type. C-D: *C. filiformis*: C) Ramri, REID s.n. D) Nepal, SHAKYA & al. 8425. E) *C. khasiana*, type. F) *C. longipes*, Nepal, Tibling, cultivated in Göteborg Botanic Garden, Liden 1985. G) *C. calycina*, type.

Magnus Liden

petals acute with entire to slightly dentate crests overtopping the apex. Spur of upper petal upwardly curved, 7–8 mm, slightly tapering towards the apex, with nectary about half as long. Lower petal boat-shaped; inner petals 7 mm long. Fruit obovoid with minutely papillose ridges, 3–6-seeded, 7–9 × 2.5 mm, abruptly narrowed into a 2 mm long style. Seeds smooth. Stigma like that of *C. crispa*.

"Damp grassy banks in forest glades", 2130—2285 m. Flowers in April.

INDIA: Arunachal Pradesh (Type). E. BHUTAN: 27°44'N, 91°14' E. *Ludlow, Sherriff & Hicks* 18765 (BM).

C. pseudotongolensis Liden, sp. nov.

(Fig. 1, Map 1).

C. tongolensis sensu C. Y. Wu in Index Flora Yunnanensis 1: 176.1984, (and sensu Handel—Mazzetti, Symb. Sin. 7: 341?), non Franchet.

Herba perennis caudici verticali elongato robusto hypogaeo. Caules subterranei simplices, supraterreani valde ramosi stricti. Folia (praesertim basalia) longe petiolata vaginata. Lamina triangularis bi-vel triternata subtus glauca foliolis plus minusve divisus lobis oblongo-flabellatis. Racemi multiflori angusti. Bracteae profunde divisae pedicellis brevibus fructiferis reflexis superantes. Sepala mediocra fimbriato-dentata. Corolla ochracea. Petala exteriora anguste alata et cristata plus minusve dentata apice acuta. Calcar petalorum superiorum 6 mm longum anguste triangulare nectario 4 mm longo. Petala interiora apice non atro-purpureo-maculata, 6 mm longa. Petalum inferius medio constrictum ungue latissimo lamina angusta acuta. Capsula anguste obovoidea vel oblonga seminibus parvis laevibus.

Typus: Yunnan: Beimashan, Huntzena SE of Atuntze (Deqin), 3100 m, under tree, 11.8.1937, T. T. Yu 9544 (KUN).

Perennial with rather deeply buried, oblong, vertical rootstock up to 1.5 cm in width, from which one, or rarely a few, annual stems arise; subterranean part of stem unbranched with few and scattered leaves, or only remnants of withered petioles; aerial part 25—50 (—70) cm, much branched from the base, with several strict branches, which are further branched above. Foliage greyish green, rather glaucous below, slightly thick in texture, often somewhat papillose-scabrid on the veins below. Basal leaves very long-stalked, vaginate at base; upper leaves with stalks usually shorter than lamina. Lamina triangular in outline, twice to almost three times ternate (to sub-bi-[tri]-pinnate) with shallowly to deeply divided leaflets with lamina decurrent on stalk. Ultimate lobes oblong to flabellate, broader and with a few mucronate teeth towards the apex. Racemes long and narrow, (5—) 10—20-flowered,

A revision of *Corydalis sect. Fumarioides*

simple or sometimes branched at base. Pedicels 2—4 mm, strongly reflexed in fruit. Bracts longer than pedicels, once to twice deeply ternately cleft into narrow acute lobes; central lobe often with a few acute teeth at apex. Sepals whitish, usually fimbriate-dentate, about 1 mm in diameter. Corolla deep yellow with conspicuously darker veins. Outer petals narrowly winged, acute, crested; crests and wings usually much dentate. Spur of upper petal straight to slightly curved upwards, narrowly triangular, about 6 mm long with nectary reaching about 2/3 through the spur. Lower petal very broad at base, constricted in the middle, and with a narrow acute lamina. Inner petals pale, 6 mm long. Fruit narrowly obovoid to oblong, 8—10×1.5—2 mm, including a 1.5—2 mm long style, 3—5(—6)-seeded. Seed to 1.5 mm, smooth, with a stout, small, shortly lobed elaiosome. Stigma squarish in outline with 4 simple papillae.

Disturbed hillsides, roadsides, screes, 3000—3700 m. s. m., July to October.
NW Yunnan, SW Sichuan, and Easternmost Tibet.

Easily distinguished from other species by the foliage. It shares the erect habit and general resemblance in flower with the closely related *C. drepanantha*, but has smaller flowers, narrower capsules and different foliage.

Specimens examined: Yunnan: Deqin (Atuntse): G. W. Wang 69872 (KUN); T. T. Yu 9544 (KUN) KGB 526 (GB, KUN); KGB 583 (GB, KUN); Zhongdian: K. M. Feng 1866 (KUN); Yang jin-sen 8964-b (KUN); Sichuan: Daocheng: T. T. Yu 12920 (A, PE, KUN); unknown 597 (CDBI); Xiangchen: Q-X-exp. 4529 (KUN); Q-X-exp. 1982, 28842 (KUN); Muli: Q-X-exp 1983, 14667 (KUN); Derong: Q-X-exp. 1981, 3413, 3264 (KUN); Maxiongkou. J. Dong 28892 (CDBI);? Yungning, Handel-Mazzetti 7062 (n. v.). Xizang: Batang prov.; Yargong, J. A. Soulé 3540 (P).

Subsect. *Fumarioides*

Erect to diffuse glabrous annuals or perennials. Stigma with 2—6 more or less stipitate apical papillae, flanked by a sessile double (geminate) papilla on each side.

Series *Fumarioides*

Syn: Series *Tuberculatae* Liden, Rhedea 1: 32. 1991. Type species: *C. tongolensis* Franchet.

Erect to diffuse annuals (*C. sibirica* sometime biennial; Popov 1937) with tiny taproots. Stems winged, leafy and branched throughout, especially in the

Magnus Liden

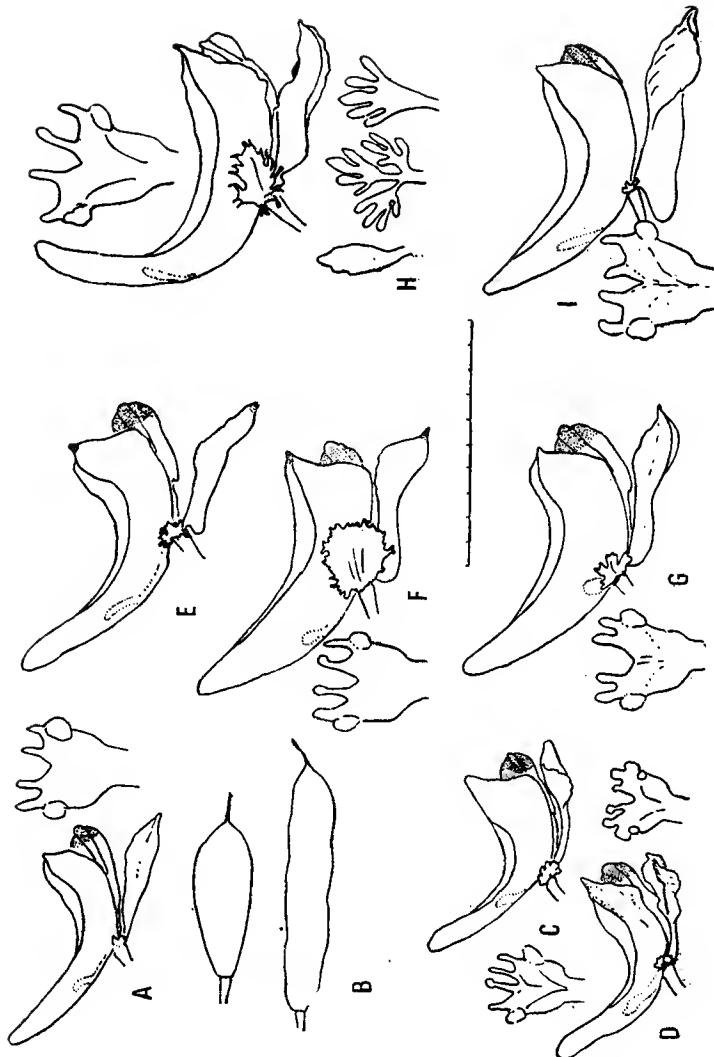


Fig. 4. Flowers and stigmas of series *Himalayanae*. A) *C. casimiriana* ssp. *brachycarpa*, type. B) *C. casimiriana* ssp. *casimiriana*, Nepal, SHAKYA & al. 8744. C) *C. gracillima*, annual type, KGB 159. D) *C. gracillima*, biennial type, KGB s. n. E) *C. rubrisepala* ssp. *zhuangiana*, type. F) *C. rubrisepala* ssp. *rubrisepala*, type. G) *C. pseudolongipes*, type. H) *C. goudii*, WOOD 7122. I) *C. changueensis*, type.

A revision of *Corydalis sect. Fumariooides*

upper half. Leaves usually bi-pinnate. Crests of outer petals protruding well beyond the apex (except in *C. zhongdianensis*). Seeds smooth or tuberculate.

***C. tongolensis* Franchet, Journ. Bot. (Morot) 8: 285. 1894.**

Type: W Sichuan, Kiala district: Tongolo, R. P. Soulie 29 (P-holo).

(Fig. 2. Map 2.)

Erect to suberect or diffuse annual 40—90 cm, with tiny taproot. Stem sparingly leafy, branched from the middle. Leaves bi-pinnate with leaflets deeply cut into obovate lobes. Racemes 10—25(—35)-flowered, subsecund. Bracts lanceolate, acute, often shortly stalked; lower ones divided or with a few acute teeth only; middle and upper bracts dentate to entire, equalling the strongly recurved fruiting pedicels which are about 5 mm long. Flowers yellow. Sepals minute, deeply dentate. Outer petals with broad entire crests that reach well beyond the apex of the petals. Spur upwardly curved, (6-)7 mm long, with nectary about half as long. Lower petal not or slightly gibbous at base. Inner petals 6 mm long. Fruit narrowly obovoid, 8—9 × 2—2.5 mm, with 2 mm long style, 3—7-seeded. Seeds tuberculate, 1.4—1.5 mm long. Stigma with four long-stipitate apical papillae, and 2 lateral geminate papillae.

West Sichuan and the extreme east of Tibet, 3000—4000 m, May to August

Specimens examined: Sichuan: Tongolo: Soulie 29 (P), 2446 (P); Kangting: Pratt 495 (BM, K), Soulie 1004 (P), J. S. Yin 4384 (SZ); SW Muli Gomba, Rock 24172 (A, BM, E, K); Yen yuan, Q-X-exp. 12408 (KUN); Muli: Gi bo shan, T. T. Yu 7643 (KUN), Rock 24172 (GH, E, K, BM); Garze, Sich. pl. coll. 329 (KUN); Dawo, Garze Pl. Coll. 230 (SM); Xizang: Lhasa to Batang, Prince Henrid, Orleans (P). Sineloco: (perhaps Muli): Forrest 28665 (E).

***C. yui* Liden, Rheedia 1: 35. 1991.**

Type: Sichuan, Muli, Kulu, margin of thickets, 3200 m., flowers yellow, 18.9.1937, T. T. Yu 14304 (E-holo, A-iso),

Similar to *C. tongolensis*, but less erect and more diffusely branched. Racemes 7—20-flowered. Sepals 1—2 mm, deeply laciniate-dentate, sometimes reddish at base. Outer petals more slender with narrower crests. Spur 6 mm long; crests and margins of outer petals strongly sinuose-dentate, narrowed into acute beaks. Capsule 4—7 × 1.5—2 mm with 2.5—3 mm long style, 2—5-seeded.

Only known from the vicinity of Muli, 3000—3200 m, July to September.

Very similar to *C. tongolensis*, but differing in the attenuate dentate

Magnus Liden

crests of the outer petals, the larger and more deeply dentate sepals, and the smaller fruit with conspicuously longer style.

Specimens examined: Sichuan: Muli: S. G. Wu 2456 (KUN), T. T. Yu 14304: (E, A), Q-X-exp. 14134 (KUN); Ku-ma-tian, T. T. Yu 7387 (PE, KUN), Q. S. Zhao & al. 7624 (SZ).

C. sibirica (L. fil). Persoon, Syn. 2: 270. 1806.

Fumaria sibirica L. fil., Suppl. 314. 1781. Type: ("London", non vidi).

C. breviflora DC., Syst. 2: 127. 1821. Type: Kamtchatka, Fischer (P-DC).

C. sibirica var. *intermedia* Regel, Bull. Soc. Nat. Mosc. 34 (2): 142. 1861.

Type: Ostsibirien, Stubendorff (not seen).

Annual (sometimes biennial according to Fl. USSR: 705) glabrous herb with tiny taproot, branched from the base. Stems sulcate, 20–80 cm, suberect to diffuse, leafy and branched throughout, especially above. Petioles with long vaginæ; lower leaves long-stalked, upper ones progressively shorter-stalked, leaves bipinnate with leaflets deeply divided into thin lanceolate (Siberian) to obovate or elliptic (China) segments. Racemes 8–15 (–20)-flowered, subsecund. Bracts narrowly lanceolate, acute, entire or the lowermost divided, longer than (Siberia) or equalling the 3–7 mm long pedicels which are strongly recurved in fruit. Corolla pale to bright yellow, outer petals with a broad or narrow crest that reach beyond the apex, often dentate, sometimes tapering into an acuminate beak (especially in Siberia), sometimes broad and obtuse. Spur of upper petal triangular-obtuse, upwardly directed, 2.5–4 mm long, with nectary reaching about halfway. Inner petals 4–5 mm long. Lower petal like the upper, basally clearly saccate. Capsule ovoid 6–8 × 3–4 mm with a sharply set off style 1.5–2 mm long, 2–7-seeded. Seeds 1.3–1.5 mm.

The distribution areas of the two subspecies recognized here are widely disjunct, and affords a parallel to the *C. impatiens/pseudoimpatiens* pair. In their vegetative differentiation the parallelism is even more striking. The ssp. *elata* is quite like *C. pseudoimpatiens* in habit, whereas ssp. *sibirica* is similar to *C. impatiens*. Unlike *C. impatiens* and *C. pseudoimpatiens*, however, the difference between the two subspecies of *C. sibirica* in bracts and floral characters are very small, and hence they are kept at subspecific level.

C. pseudoimpatiens is distributed to the N and W of *C. sibirica* ssp. *elata*, and there seems to be very little overlap.

A revision of *Corydalis sect. Fumarioides*

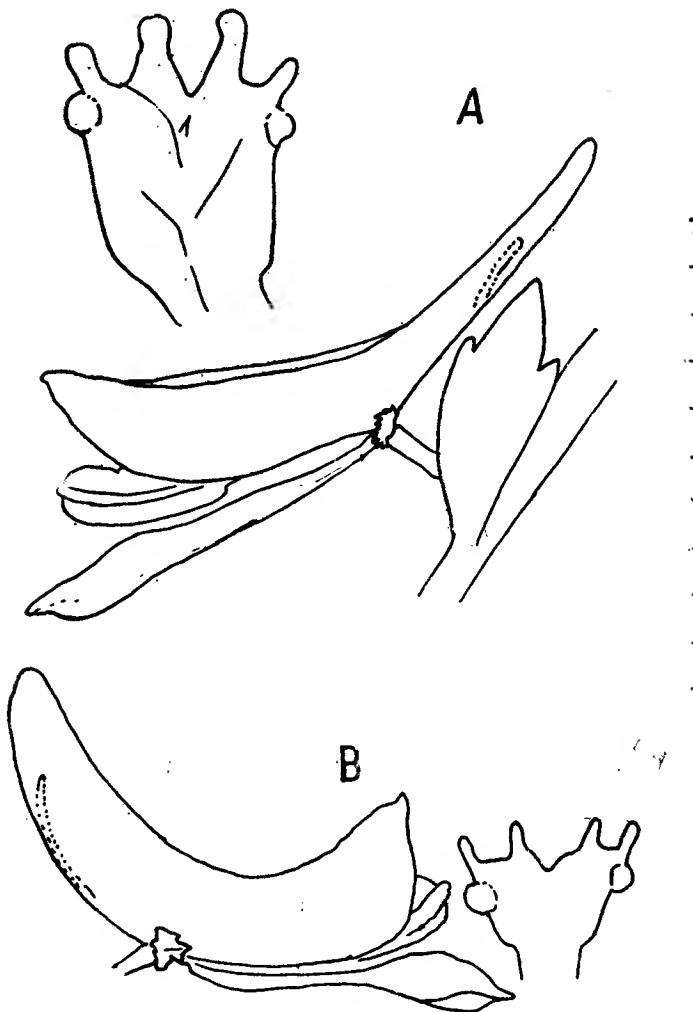


Fig. 5. Flowers, stigmas and bracts of A) *C. lathyroides*, Nepal, SHAKYA & al. 8531. B) *C. pseudodrakeana*, type.

Magnus Liden

ssp. *sibirica*

20—50 cm high with lanceolate leaf-segments. Bracts usually longer than pedicels. Crests of outer petals often prolonged into a dentate acuminate beak.

Siberia, Mongolia and NE China. This subspecies has not been studied in detail.

ssp. *elata* Liden, ssp. nov.

(Fig. 2, Map 3.)

C. sibirica var. *intermedia* sensu Fedde, non Regel.

A type differt habitu elatiore foliolis latioribus obtusis bracteis brevioribus.

Typus: Sichuan, Kangding distr.: Chungo valley, Hsintientzu, in fruticetis, 3800 m. 24. 8. 1934, *H. Smith* 11394 (UPS).

Differs from ssp. *sibirica* in broad obtuse leaflobes, tall stems (50—80 cm high) that are less branched at base, shorter bracts (more or less equalling the pedicels), usually slightly longer spur, and outer petals with broader and more obtuse crests.

In open forests and shrubberies, rarely in screes, 3200—4100 m, July to September. Central and North Sichuan.

Specimens examined: Sichuan: Tapaoshan Kangling, Z. S. Liu (1320 KUN); Daofu, *si. pl. res. exp.* 15650 (KUN); Dawo, Haitzeshan, *H. Smith* 11349 (UPS), 11586 (UPS); Hsiochshan, *H. Smith* 3681 (GB, S, UPS); Karlong, *H. Smith* 4109 (GB, S, UPS); Ganzi, Jiong Su 9634 (KUN); Niutoushan, Liljestrand 160 (UPS); Kangding distr., Cheto La, *H. Smith* 10962 (UPS), Chungo valley, Hsientientzu, *H. Smith* 11394 (UPS).

ssp. *zhongdianensis* Su Z. Y. & Liden, sp. nov.

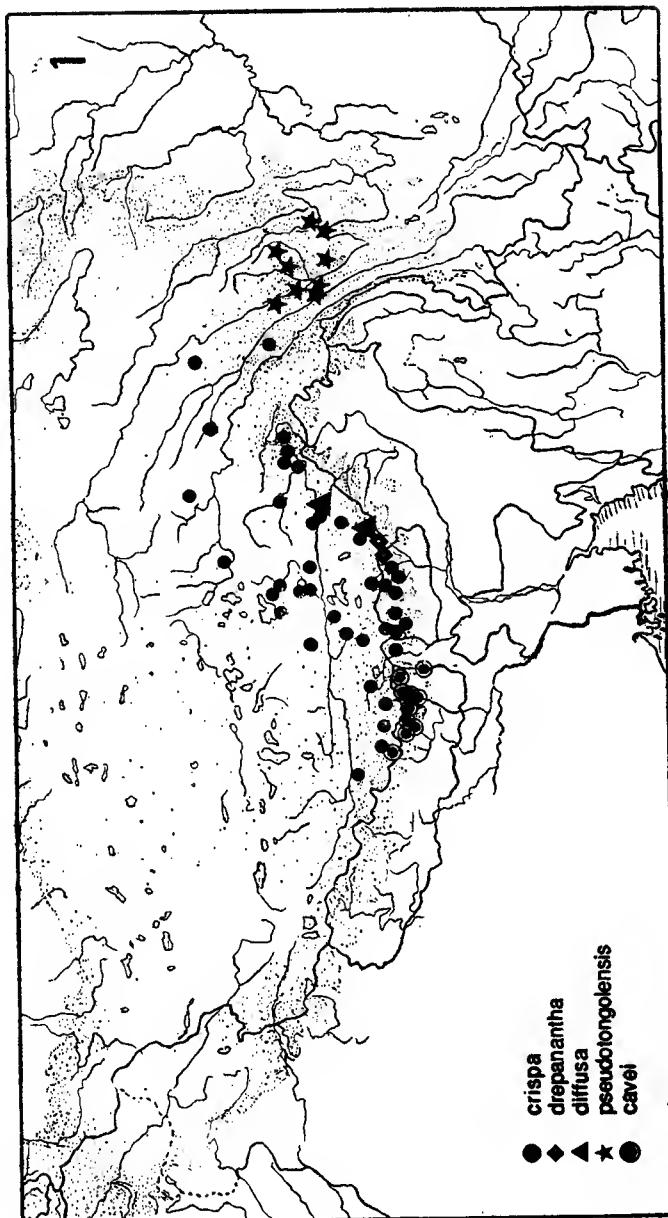
(Fig. 2, Map 3.)

A. *C. sibirica* differt bracteis latioribus floribus majoribus purpureis nectario longiore alae petalorum exterioribus angusti non petalo superanti.

Typus: NW Yunnan, hills above Napa Hai close to Zhongdian, 3600 m, 16. 9. 1993, B. Alden, M. Liden, Su Z. Y., Lu R-F., & H. Zetterlund (KGB) 77 (GB-iso, KUN-holo).

Annual. Stems much branched, sulcate, 50—80 cm. Leaves with long-sheathing petioles, dark green, pinnate with 2—3 pair of biernately divided leaflets. Leaflets shallowly cleft; ultimate lobes obovate, mucronate. Racemes dense, 10—16-flowered. Bracts rhombic-acute, slightly denticulate, 4—8 mm. Pedicels recurved in fruit, 2(—4) mm long. Sepals minute. Corolla broadly triangular, brownish purple, very narrowly crested. Spur of upper

A revision of *Corydalis* sect. *Fumarioides*



Map 1. Known distribution of subsection *Radicosia*.

Magnus Liden

petal 5 mm long, broad at base, obtuse, with nectary $\frac{3}{3}$ — $\frac{3}{4}$ as long. Lower petal usually shallowly saccate at base. Inner petals pale, 5.5—6 mm long. Fruit obovoid, 8—10 \times 3—4 mm with 2 mm long style, (1—)6—9-seeded. Seeds shiny, about 1.7 mm, with small elaiosome.

NW Yunnan and SW Sichuan, apparently rare. Disturbed ground, 3100—3700 m. July to October.

Vicariant with the related *C. Sibirica* but recognized at a glance by the large wine purple, narrowly crested flowers and the rhombic bracts.

Specimence examined: Yunnan: Meili Xueshan, E slope by the track-side, KGB 398 (GB, KUN); Zhongdian: Jiang Ju-Sen 8214 (KUN), 8964a (KUN), T. T. Yu 17612 (KUN), KGB 77 (GB, KUN), Zhongdian exp. 801 (PE); Lijiang, C. Y. Wu & D. Y. Liu 21126 (PE). Sichuan: Xiangcheng, Q-X-exp. 4612 (KUN).

C. impatiens (Pall.), Candolle. A. P. de, Syst 2: 124. 1821.

Fumaria impatiens Pall., Reise 3: 286. 1776.

C. sibirica var. *impatiens* Regel., Bull. Soc. Nat. Mosc 34 (2): 143. 1861.

Type: Dauria, Pallas (B-WILLD no 12924 lecto, LEN, P-DC).

(Fig. 2)

Very similar to *C. sibirica*, but stems less erect and more branched from the base, 10—40 cm, with broader lvs. Leaves thicker in texture, often less divided. Racemes 5—11-flowered, rather lax in fruit. Lower bracts divided, sometimes leaf-like; middle and upper bracts usually entire, longer than the 3—5 mm long pedicels that are reflexed in fruit; Corolla pale yellow with rather narrow, usually dentate crests. Spur of upper petal 2—3 mm. Lower petal devoid of basal gibbosity. Inner petals 4—5 mm long. Capsule oblong, 9—14 \times 2 mm with a short 1 (—1.5) mm long style, unisexual, 3—8-seeded. Seeds 1.6—1.7 mm.

Siberia and Mongolia. Probably present also in inner Mongolia and Heilongjiang. Not mapped.

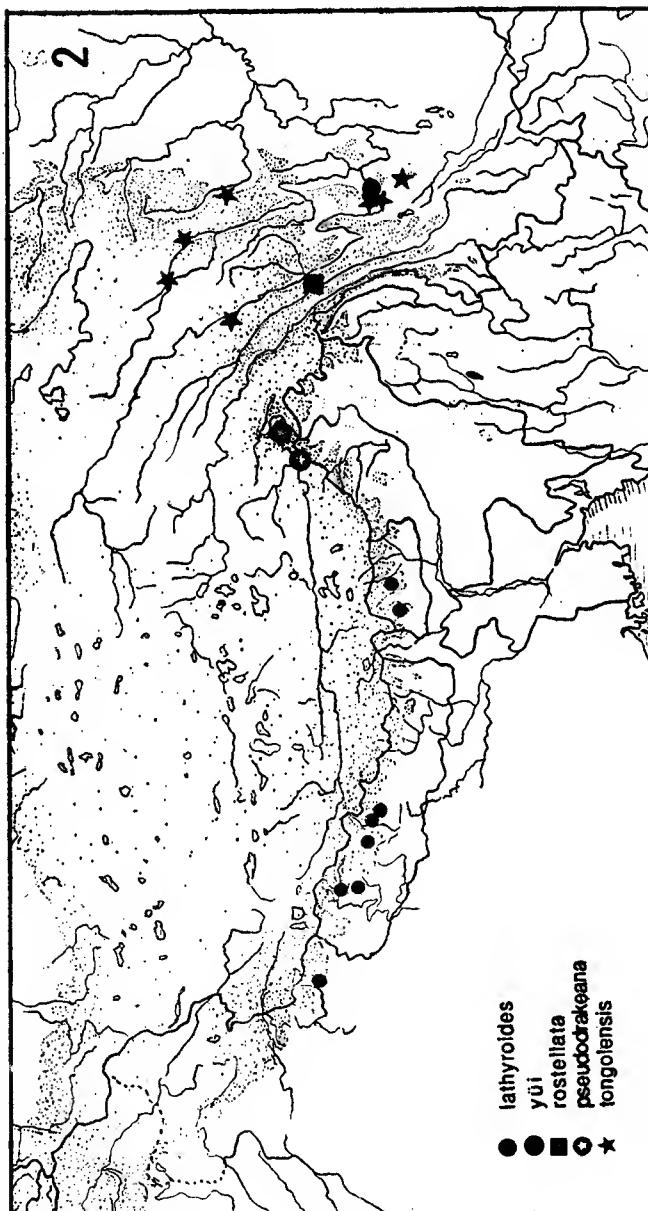
C. pseudoimpatiens Fedde, Feddes Report 21: 46. 1925.

Type: N Sichuan, Karlong, 3400 m, H. Smith 3019 (UPS).

(Fig. 2. Map 3).

Stems erect to suberect, to 75 cm tall, sparingly branched, mostly above. Leaves regularly bi-pinnate with opposite pinnae; leaflets deeply divided into elliptic obtuse to subacute lobes. Racemes dense, 10—20-flowered, subsecund. Bracts small, dentate or divided throughout the inflorescence,

A revision of *Corydalis* sect. *Fumariooides*



Map 2. Distribution of some species of subsect. *Fumariooides*.

Magnus Liden

equalling the 3—4 mm long pedicels which are recurved in fruit. Corolla white (?) or pale yellow, with rather broad dentate crests. Spur of upper petal 3—4 mm long. Lower petal devoid of basal pouch. Inner petals 4—5 mm long. Fruit linear, 8—10×1—1.5 mm with style 1.5 mm, 3—5 seeded, uniserrate. Seeds 1—1.2 mm.

Gansu, Qinghai, Sichuan, NE Tibet. 1700—3300 m.

Similar in flower to *C. impatiens*, but quite different in habit, bracts, fruits and seeds.

Specimens examined: Sichuan: Wilson 3189 (P, K); Ka-lung-pan, H. Smith 3019 (UPS); Huang-chen-kuan, H. Smith 3997 (UPS); Zoige, P130 (SM); Abal Xizang Drug Exp. 838 (HNWP); Heishui, X. Li 73226 (PE); Derong, Q Z. Exp. 3431 (KUN). Gansu: Przewalski s. n. (BM); Zaluk, Hummel 4305 (S); Ka-tien-kuo, Hummel 4147 (S); Lanzhou, Y. Q. He 5659 (PE); Minxian, Z. B. Wang 4618 (KUN, PE), Xiahe, Z. B. Wang 6907 (PE, WUK); Qiongsha, Z. B. Wang 5561 (PE, WUK); Lianhua, Y. Q. He 4964 (PE, WUK); Sunan, Hexi Exp. 237 (PE); Maqu, WUK 18 (WUK). Qinghai: Sining, Lanze cheon kou, Ching, R. C. 589 (E, S, P, W, GH); Huangyuan, P. Q. Zhong 8946 (PE, WUK, HNWP); Menyan, P. Q. Zhong 10041 (PE, WUK, HNWP); Qilian, P. Q. Zhong 8628 (PE, KUN, WUK); Huzhu, B. Z. Guo 9375 (PE, KUN, HNWP); Ledu, QingGan Exp. 1452 (HNWP); Xunhua, Z. D. Wei 353 (WUK); Tongde, S. Chen 2205 (WUK). Xizang: Jomda to Joyong, Y. W. Cui 5331 (PE); Gonjo, Q. Z. Exp. Veg. Gr. 9762 (PE-Ec.).

C. rostellata Liden, sp. nov.

(Fig. 2, Map 2.)

Herba annua debilis radice palari tenuissima. Caules erecti flexuosi. foliati ramosi. Folia tenuissima subtus glauca, lamina triangulari triternata vel sub-tripinnata, foliolis integris vel profunde divisis, segmentis ultimis obovatissi obtusis mucronatis. Racemi pluri terminales et axillares multiflori. Pedicell breves in statu fructifero valde reflexi. Bracteae tenuis lanceolatae vel anguste oblongae saepe acuminatae, vulgo parce dentatae, pedicellis longiorae. Sepala parva dentata. Corolla albida parva. Petala exteriora angusta longe acuminata anguste cristata, crista apicem petalorum manifeste superanti. Calcar petalorum superiorum 5 mm longum, strictum angustum nectario paulo breviore. Petala interiora 4—5 mm longa, albida. Capsula obovoidea seminibus parvis laevibus. Stigma cum duobus papillis apicalibus.

Type: NW Yunnan, Xishan above Deqin (Atuntse), shady places under bushes, 3300 m., 23. 9. 1993, Kunming-Goteborg Botanical expedition (KGB) 433 (GB-holo, KUN. E).

A revision of *Corydalis* sect. *Fumariooides*

Annual with a small tiny taproot: Stem erect to suberect, very weak, flexuous, leafy and branched throughout, 20—40 cm. Leaves thin, green above, glaucous beneath; lamina triangular in outline, tri-ternate to sub-tripinnate; petiole of lower leaves almost as long as blade, vaginate at base; uppermost leaves shortly stalked; leaflets entire to deeply lobed; ultimate lobes obovate-obtuse, mucronate. Racemes several, terminal and axillary, (5—)10—15(-20)-flowered, shortly stalked. Pedicels short, 2 mm, strongly reflexed in fruit. Bracts thin, lanceolate to narrowly oblong, often acuminate at apex, entire or usually slightly dentate, upper ones 2—4 mm, lower ones up to 1 cm long. Sepals up to 1 mm, finely and deeply dentate. Corolla cream with greenish keels, very small. Outer petals narrow, long acuminate at apex with short narrow obtuse entire crests; spur of upper petal 5 mm long, rather narrow and straight, with nectary at least $\frac{3}{4}$ as long. Lower petal slightly saccate to almost straight. Inner petals 4—5 mm long, not dark-tipped. Capsule obovoid, 7—10×2 mm, including a 2 mm long, sharply set off style, 3—9-seeded; stigma small with only two stalked apical papillae. Seeds smooth, 1.2—1.3 mm, with a small elaiosome.

Shady places in secondary bushland on disturbed slopes, 3300—3500 m. September.

Only known from two collections close to Deqin

Specimens examined: NW Yunnan: Deqin, KGB 433 (type); KGB 582 (GB).

Series *Himalayanae* Liden, *Rheedia* 1: 32. 1991. Type species: *C. longipes* DC.

Diffusely branched ascending annuals to perennials, often much-branched from the base. Leaves twice (to three times) ternately divided. Crest of upper petal not reaching beyond the apex. Seeds smooth.

***C. filiformis* Royle, Ill. Bot. Himal.: 68. 1833.**

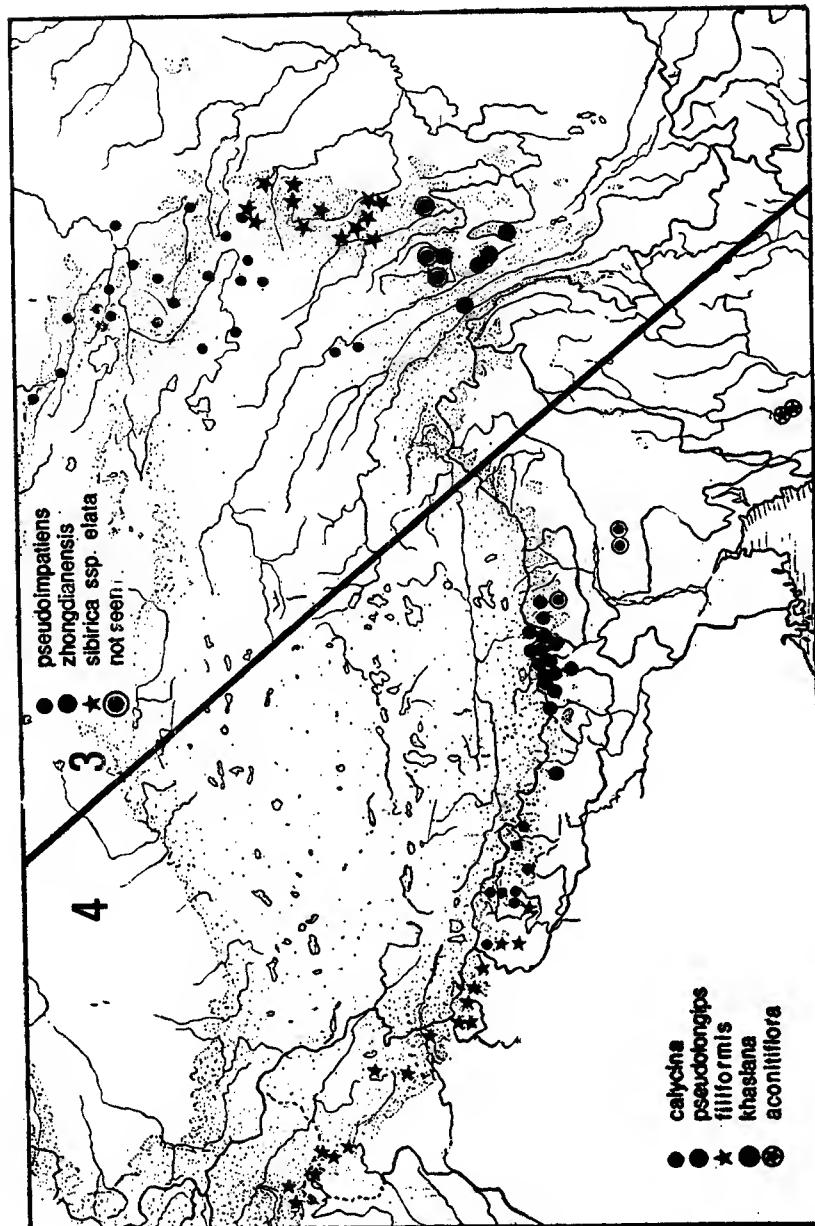
Type: Surkunda to Mussorie, 17/6 Royle (LIVU-holo)

C. longipes sensu Jafri 1974, non DC.

(Fig. 3, Map 4.)

Ascending to subscandent annual of perennial 30—70 cm, with taproot; sometimes with fleshy adventitious roots. Leaves long-stalked, twice ternate, with deeply lobed leaflets. Ultimate lobes obovate to narrowly obovate, obtuse. Racemes 3—12-flowered. Lower bracts much divided; the upper often narrowly clavate and entire, shorter than the slender somewhat arcuate pedicels that are 10—20 mm long in fruiting stage. Sepals large, 2—3×1.5—2 mm, deeply fimbriate whitish, yellow or often reddish. Corolla yellow, 10—12 mm long. Outer petals cristate, acuminate. Lower petal not constricted in the middle, 8—9(—10) mm, with a prominent basal pouch and a short low crest at apex. Inner petals pale (in Nepal) or usually tipped with blackish purple, but with pale

Magnus Liden



A revision of *Corydalis* sect. *Fumariooides*

dorsal wings. Nectary about half as long as spur. Fruit 8—10 mm, obovoid, 8—18-seeded, biseriate, with a 3 mm long sharply set off style and stigma with 6 apical papillae. Seeds 1.1—1.3 mm, glossy.

Disturbed patches in alpine meadows, in bushes, etc, 2500—4000 m. Flowering late June-September.

Distributed from SE Kashmir to WC Nepal.

Similar to *C. longipes*, but with the inner petals usually tipped with blackish purple, a nectary up to half as long as the spur (and fused to it for most of its length), and much larger sepals.

Specimens examined: W Himalaya: Laka, Dharmasala, Clarke 23828 (K); Jubal distr, Chor, Collett 5403A (K); Gulmarg, Coventry 6/330 (K); Gahrwal, Ramri, Duthie 3825 (K), Reid (E); Gurais, Falconer 128 (Rotand pass, Kirkpatrick 14 (E); Bashar, Chasu to Baspu valley, Lace, J. H. 408 (E); Hazara, Shahid Pani to Nadi, Nasir & Khan 9677 (RAW); Khelanmarg, Polunin 56/238 (E); Dakoani, Reid (E) Armium Gleng, upper Liddar valley, Stewart 9361 (RAW, K), Fras Nag, Yasin marg, Stewart 23215 (K); Suni, Sutlej Noo, Watt (Cooke) 10172 (E). Nepal: See Liden (1989).

C. calycina Liden, Bull. Brit. Mus. (Nat Hist.) Bot. 18 (6): 532. 1989.

Type: W Nepal, Mahariqaon ($29^{\circ} 22' N$. $82^{\circ} 24' E$), 3200 m. 14/7 1952.

Polunin, Sykes & Williams 158 (BM-holo).

(Fig. 3, Map 4.)

Weak, suberect usually diffuse annual or perhaps short-lived perennial, 15—40 cm, branched throughout. Leaves like in *C. filiformis*. Racemes 5—14-flowered. Upper bracts small, entire; lower ones sometimes larger and more or less divided, shorter than the slender 10—20 mm long pedicels. Sepals 2—3 × 1.5—2 mm, dentate to lacerate, often early caducous, whitish. Corolla 9—11 mm, yellow. Spur of upper petal slightly longer than to subequaling the inner petals. Wings and crest of upper petal board, abruptly terminating and leaving the short filiform apex free. Lower petal about 6 mm long, devoid of crest and basal pouch, not constricted in the middle, rather broad. Nectary fused to the spur for most of its length, 2.5—4 mm long. Fruit 5—9 × 2 mm, narrowly obovoid, 8—10(—14)-seeded with style 2—2.5 mm long stigma with 4 stalked apical papillae. Fruit 5—9 × 2 mm, narrowly obovoid, 8—10(—14)-seeded, with style 2—2.5 mm long. Seeds 1.2 mm, shiny, biseriate.

Moist open grassy slopes, pastures, paths, 3100—4600 m, flowering late June to late September.

Endemic to Nepal westward from Annapurna (see Liden 1989).

Magnus Liden

C. longipes Candolle, A. P. de, Prodr. 1: 128. 1824.

Type: Nepal, *Wallich* 1433a (G-holo, BM, K, K-W).

C. pubescens C. Y. Wu & H. Zhuang in Wu, C. Y. (ed.), Fl. Xiz. 2: 311. 1985.

Type: Xizang: Nyalam, 2200 m, K. Y. Chang & K. Y. Lang 3388 (PE).

(Fig. 3.)

Glabrous or rarely papillose-hairy ascending to subscandent annual or short-lived perennial with leafy slender branched trailing stems 20—75 cm. Leaves twice ternate, segments deeply lobed; lobes 1—4 mm broad, narrowly obovate, obtuse. Upper leaves smaller and less divided. Lower petioles long, upper ones gradually shorter. Racemes long and slender, lax, 5—14(—19)-flowered, soon longer than the short peduncle, elongating in fruit. Bracts 1/5—1/2 as long as the pedicels, dentate to lobed, the lower often leaf-like; the upper sometimes entire. Pedicels slender, 10—20 mm, somewhat elongating in fruit. Sepals 1(1.5)×1—1.5 mm, whitish, deeply circumdentate, broadly reniform, shed together with the corolla. Corolla pale to bright yellow, 9—12 mm long from the apex of the spur to the tips of the inner petals, broadly cristate, jasmine-fragrant. Outer petals long-acuminate, with the crest attenuate towards the apex. Inner petals equalling spur, never dark at apex. Lower petal usually shortly cristate, 7—9 mm long, with a basal pouch, constricted in the middle. Nectary very short but prominent, up to 1/5 as long as the spur. Fruit 6—10 × 2—3 mm, obovoid, 8—15 seeded, abruptly narrowed into a 2—3 mm long style. Stigma with six apical papillae. Seeds shiny, biseriate, 1.0—1.2 mm. 2n=16. Self-sterile.

Along shady paths in forests, wet stony places, fieldmargins, roadsides, 2000—3500 m. Flowering June to October.

Central Nepal (see Liden, 1989); one record from Tibet (*C. Pubescens*).

Polunin 1627 deviates in its white corolla with lemon-yellow front, longariste and purple-tinged at the very apex. The type of *C. Pubescens* is exceptional in its prominent pubescence.

C. Pseudolongipes Liden, Bull. Brit. Mus. (Nat. Hist.) Bot. 18 (6): 532. 1989.

Type: E. Nepal, Bhararate Himal S of Makalu, Barun Khola below the Yang La Pasture, 3500 m, 4. 10. 1972, T. Wraber 385 (BM-holo).

C. longipes var. *burkilli* Fedde, Feddes Repert. 16: 314. 1920.

Type: Sikkim Singale-La, 3660 m, /9. 1906, J. H. Burkhill 27664 (K).

C. longipes var. *phallutiana* Fedde, Feddes Repert. 16: 314. 1920.

Type: Sikkim, Phallut, /10. 1908, Ribu 355 (K).

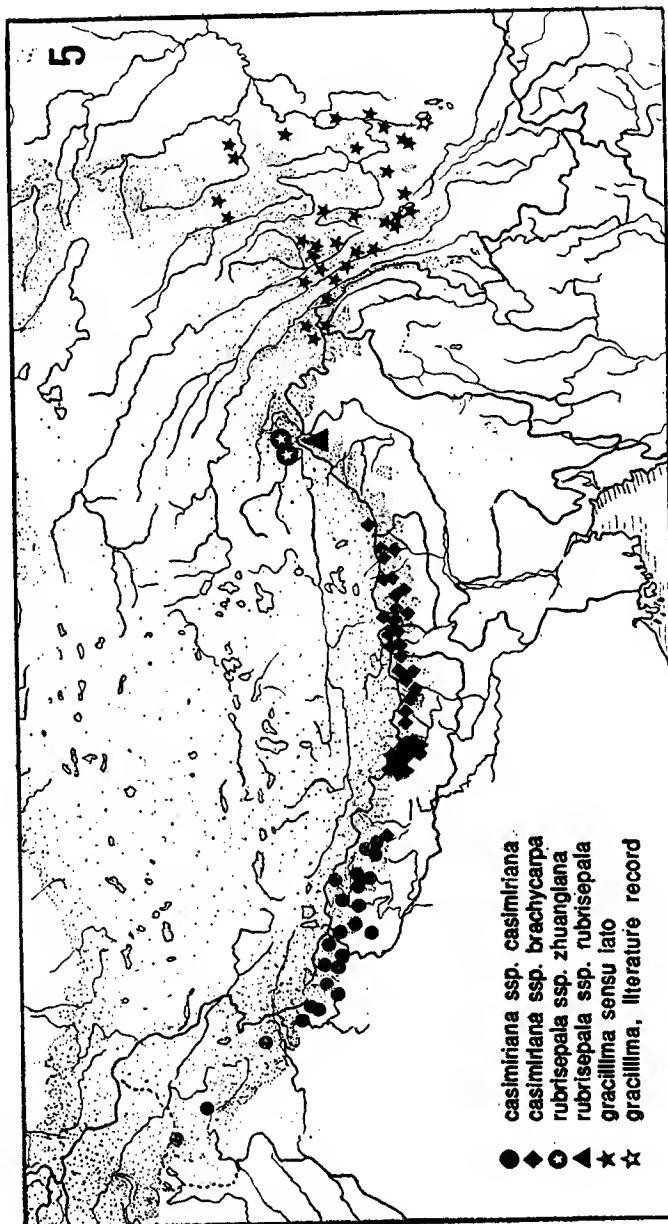
C. longipes var. *smithii* Fedde, Feddes Repert. 16: 314. 1920, (p.p. incl. type)

Type Sikkim, Shorabthang, 3960 m/8. 1910, W. W. Smith 4303 (E).

C. longipes sensu Long, Notes RBG Edinb. 42. 1984.

(Fig. 4, Map 4.)

A revision of *Corydalis* sect. *Fumariooides*



Map 5. Distribution of some species of series *Himalayanae*.

Magnus Liden

Stem much-branched from the base, 15–40 cm long. Racemes 3–10-flowered. Bracts usually divided throughout the inflorescence or rarely the uppermost entire, more than half as long as the 5–10(–15) mm long, slender pedicels. Sepals small, c. 1 mm, often deeply divided, rarely minute, entire. Upper petal acute or very shortly acuminate, narrowly cristate. Spur 5–6 mm long curved upwards, slender, with a prominent nectary up to 1 mm long. Lower petal with a basal pouch and a median constriction. Inner petals 5–6 mm long, tipped with blackish purple. Fruit 5–7×2 mm obovoid, often minutely papillose all over the surface, up to 10-seeded. Style 1.5 mm long. Stigma with 4 stalked apical papillae. Seeds 1.2 mm, shiny, biseriate.

"Slopes", 2800–4000 m. July to October. East Nepal, Sikkim, Bhutan, S Tibet.

Specimens examined: E. Nepal, see Liden 1989. Sikkim: Jongri Anderson 370 (A); Tongloo, Anderson 364 (B); Singale-La, Clarke 12585, 12710 (K, BM), Changu, Cooper 500 (KATH, BM); Chamnago, Cooper 849 (E, BM); Lachung-Hooker s. n. p. p. (K). Darjeeling: Phullatong, Clarke 13480 (K); Inglo, Clarke 25788A (K). Bhutan: Hab Pum-Ka Lee-See-mo, Dungbo 229. (E); Xizang: Yadong (Chumbi), R. E. Cooper 184 (E); Ringchingring (Chumbi), Dungbo 4226 (UPS); Champitang, Yan Feng 77023 (HNWP); Phari: G. H. Cave sept. 1916 (E), Q. Z. exp. 74-2321 (PE, KUN).

C. changuensis D. G. Long, Notes RBG Edinb. 42: 102. 1984.

Type: Sikkim Changu, 4000 m., R. E. Cooper 845 (E).

(Fig. 4)

Annual or perhaps perennial, branched from the base, 12–30 cm long. Leaves bi ternate with leaflets deeply divided into obovate-obtuse segments. Racemes lax, 3–6-flowered. Pedicels 4–10 (–15) mm. Bracts shorter than pedicels, the lowermost often deeply divided, the upper entire, broad at apex. Sepals 0.5 × 1 mm, dentate. Upper petal acute at apex, crested; crest decurrent on spur and attenuate towards the apex. Spur 7–10 mm long with nectary at least half as long. Lower petal very deeply saccate or with a short supr up to 2 mm long at base, broadly winged, abruptly narrowed to an acute apex, not crested. Inner petals 7–8 mm long, tipped with dark purple. Fruit narrowly ellipsoid to oblong, 6–8 × 1.5–2 mm, up to 6-seeded. Style 2–3 mm long. Stigma widened at the very apex with 4 apical stipitate papillae. Seeds 1.2–1.3 mm,

This, apparently very local species, may possibly be of hybrid derivation. It is larger in all parts, but otherwise intermediate in most characters between *C. pseudolongipes* and *C. casimiriana*, both of which occur at the type locality.

Specimens examined: Sikkim: Changu: Cooper 854 (E, KATH): Cave sept. 1916 (E) "Tibet, Changi" Cutting & Vernay s. n (K).? Sikkim: Changu?

A revision of *Corydalis sect. Fumariooides*

C. casimiriana Duthie ex Prain, J. Asiat. Soc. Beng. II, 65(2): 27. 1896.
C. prainiana Kanodia & Mukerjee, Rec. Bot. Surv. India 20: 32. 1973, *nomen superfluum*.

Type: Kumaon, *Duthie* 5312 (CAL, BM)

C. stewartii Fedde, Feddes Repert. 19: 119. 1923, (not in the sense of Jafri 1974).
Type: Kashmir, Sonamarg, 9600 feet, 19. 7. 1921, *R. R. Stewart* 6304 (B).

(Fig. 4, Map 5)

Similar to *C. pseudolongipes* vegetatively. Racemes 4–11-flowered with rather long peduncles. Middle and upper bracts often entire, shorter than the 5–10(–15) mm long slender pedicels. Sepals 0.5–1 mm, dentate, reniform. Corolla 8–10(–11) mm long, more narrowly winged than in *C. pseudolongipes*, yellow. Outer petals acute at apex or very shortly acuminate. Spur equalling or often longer than the inner petals, narrow, often curved upwards. Lower petal not cristate, 5–6 mm long, without a basal pouch and not constricted in the middle, very rarely with a cornute, minute spur at base (*Bowes Lyon* 3316 p.p.). Nectary fused to the spur, 2–3 mm long. Inner petals usually tipped with blackish purple. Style 1.5–2 mm. Stigma with 4 stalked apical Papillae. Fruit 6–10-seeded. Seeds shiny, c.1 mm. Self-fertile.

Open grassy slopes, pastures, frequent in burnt sites; 2800–4700 m.

Two vicariant taxa; East and West of the Annapurna area:

ssp. **casimiriana**: Fruit 12–15 × 1–1.5 mm, linear, with seeds in one row.

Specimens examined: India & Pakistan: Budrinath, *Edgeworth* 80 (K). Rotang pass, *Stewart* 4490 (RAW); Garwal, *Duthie* 947 (BM); Kumaon, Rama, Dhauli valley, *Duthie* 2713 (K); Palang Garh, Byans, *Reid* s. n. (E); Kashmir: Liddarwat, Kolahir, *Duthie* 13521 (K). W. Nepal: See Liden (1989).

ssp. **brachycarpa** Liden, ssp. nov.

A typo differt capsulis brevioribus anguste, obovatis.

Typus: Sikkim, Changu, *Cooper* 550 (E-holo, KATH, BM).

Fruits 8–10 × 2 mm, narrowly obovoid, uni- to sub-biseriate.

Common from Central Nepal eastwards to Bhutan and slightly beyond.

Specimens examined: Nepal: See Liden (1989). Sikkim: Phedang, AGSES 361 (K), Sherabthong, *Cooper* 808 (KATH, E); Changu, *Cooper* 550 (KATH, BM, E). Darjeeling: *Gamble* 3903A (K). Xizang: Chumbi, *Dungbo* s. n. (E), *Bell* s. n. (K), *Cooper* 718 (KATH, E); Nyalam, *Xiz. Drug Herb. Exp.* 72–1502 (PE, HNWP); Champitang, *Chapman* 955 (K); E of Yatung, *Chapman* 956 (K), Cona, *O. Z. Exp. Suppl. coll.* 75–1892 (PE, KUN, HNWP). Bhutan: Rudo La;

Magnus Liden

Ludlow, Sherriff & Taylor 26984 (K); *Dochu La, Hara & al.* s. n. (TI); *Bamtang, Tashilung, Bowes Lyon* 3316 (BM, E); *Kopub, Punethang, Cooper* 2136 (E); *Timphu, Phajudin, Cooper* 2700 (E); *Ohra Pimthang, Cooper* 4740 (E, BM); *Saka La to Ho. Gould* 1050 (K); *Goktang La, Mangde Chu, Ludlow & Sherriff* 17306 (E); *Guicha La, Ribu & Rohmoo Lepcha* 7052 (E).

C. gracillima C. Y. Wu. Index Fl. Yun. 1: 172. 1984. & Fl. Xiz. 2: 319. 1985.

C. gracilis Franchet (1886, 1889) non Ledeb.

Type: Yunnan. Heqing. "in silvis ad collum Kova-la-po (Hokin)" according to type description, 3000 m, 4. 8. 1885, Delavay 18 (8) 62 (P). Same number: Eryan, "Hee chan Men Lankong" (P).

C. gracillima var. *microcalcarata* Zhuang, Acta Bot. Yunnanica 13: 17. 1991.

Type: Yunnan: Deqin. K. M. Feng 24048 (KUN). (Fig. 4 Map 5.)

Tap-rooted annual (but see below), branched from the base, never with adventitious fleshy roots. Leaves small, two to three times ternate. Racemes subsecund, 4—7-flowered, lax. Bracts small divided into 3—6 obovate lobes, rarely the upper ones entire; lowermost bracts often more leaf-like. Pedicels strongly recurved in fruit, 4—8 mm long. Sepals up to 1 mm, rounded, circundentate. Upper petal rather broad at apex, with a narrow crest that does not reach the apex. Spur narrow, upwardly curved, 5—6 mm with nectary about half as long. Inner petals 4.5—5 mm, tipped with blackish purple; claw rather broad. Lower petal with a narrow claw and rhombic-acute limb. Style 1—1.5 mm long. Stigma with rather prominent geminate papillae and four stipitate apical papillae. Fruit narrowly ovoid-oblong, 8—10 × 2—2.5 mm, 7—14-seeded. Seeds small, shiny, about 0.8 mm.

Disturbed open ground, roadside gravel, etc. 2700—4500 m. (March to April) August to October.

Widespread in SW China (Yunnan, Sichuan, SE Tibet, N Burma).

An elegant little species with the black tip of the inner petals contrasting the golden yellow corolla. It is very similar to *C. casimiriana*, but the bracts are more divided, and the seeds are smaller, more numerous, and always distinctly biseriat. Also the habitat and life-form is different (but see below), and their geographical areas are widely separated.

During the KGB (Kunming/Goteborg) expedition 1993 to NW Yunnan, we met with two distinct forms of this species. An autumn-flowering annual was quite common 3400—4200 m along roadsides and in gravel. It corresponds to Delavay's type. Close to Zhongdian, we collected a spring-flowering biennial growing as a chasmophyte on wet mossy cliffs. We found small

A revision of *Corydalis* sect. *Fumarioides*

rosettes only. A similar plant was collected in seed by a Kunming-Edinburgh-expedition the year before. It differs from typical *gracillima* in the narrower and less spatulate lower petal, the shorter stigmatic papillae and the larger elaiosome. Although this form differs remarkably in life-form and habitat, the floral differences are very small. More studies are needed to clarify these forms. It has not been possible to group all the specimens cited below in these two groups. Monbeig's Tsekou collection was collected in March, and is presumably the biennial form. One of the biennial collections cultivated in Goteborg has a minute spur on the lower petal, and it is possible that some specimens referred to var. *microcalcarata* by Zhuang (1991) represent the biennial type.

Specimens examined: Yunnan: Dali, *Tokyo Kunm Exp.* 1485 (KUN); Daxueshan, KGB 152 (GB); Xiaoxueshan, KGB 159 (GB); SE Bamashan KGB 282 (GB); Tianchi lake W Xiao Zhongdian, KGB s.n. (KUN); Tsawarung, C. W. Wang 65520 (A); Deqin, T. T. Yu 22601 (KUN, PE); Yongzi, G. M. Feng 7736 (PE, KUN); Gongshan, C. W. Wang 67051 (PE); Bijiang, H. T. Tasi 54142 (PE, KUN); Doker La, *Kingdon Ward* 1102 (E); Tseku, *Monbeig* s. n. (P); Ta Long Tan, *Delavay* s. n. (P); Tchong Yong Whong S of Mosoyn, *Delavay* 3398 (P); Col de Yentzehay (Eryan?) *Delavay* 3681 (P), Between Zhongdian and "Djidsung" H-Mz 7761 (E, WU, ISCB), 1345 (n. v.); Between Yungning and Yungbei, H-Mz 3297 (W, WU); Lou Pou (Dongchuan), *Maire* s. n. (E, P); Ma-li-ouan (Huize), *Maire* 261 (E, P); Petsaolin by Beyendjing (Dayao?), *Simeon Ten* 1345 (C); Binchuan, W. C. Wu & al. 12132 (PEY); Lijiang, *Forrest* 2825 (E, K); Kunming, Xishan, Mell (?W, n.v.); Luquan, Y. B. Zhang 573 (PE, KUN); Wumungshan, M. W. Zhu & J. L. Wu 2811 (WUK); Qiaojia, NE Yunnan *Exp.* 1420 (KUN). Sichuan: Lungchu-shan by Huili, H-Mz 5177 (W, WU, n. v.); Meigu, *Sich Pl. coll.* 13247 (PE, CDBI); Kangding, McLaren AC 136 (E, P); Emei shan, *Faber* 480 (K, BM), F. T. Wang 23416 (A, P, LE, PE, KUN, NAS, WUK, LBG); Yajiang, Jiang & Jin 2663 (SZ); Jinding, C. Y. Wu 6375 (KUN). Burma: Seingkuo, *Kingdon Ward* 7540 (K); Laktang, *Kingdon Ward* 3578 (E). Xizang: Tsarong, C. W. Wang 65228 (A, PE); Zayu, 28° 26' N, 94° 21'E, *Kingdon Ward* 10003 (BM); 28° 10'N, 97° 20'E, *Kingdon Ward* 7540 (BM).

C. rubrisepala Liden, *Rheedia* 1: 34. 1991.

Type: East Himalaya, Assam, Ze La, 14000 feet, 22. 8. 1922, "slopes among dwarf Rhododendrons, bright yellow, calyx red", *Kingdon Ward* 14138 (BM-holo).

(Fig. 4. Map 5)

Like *C. casimiriana* vegetatively. Racemes 3–8-flowered. Bracts small, divided, or the upper ones entire, shorter than the 5–15 mm long, recurved fruiting pedicels. Flowers bright yellow except for the sepals which are red,

Magnus Liden

and the apices of the inner petals which are tipped with blackish purple, as are the very tips of the outer petals. Sepals $2.5 \times 2-2.5$ mm, rounded, finely dentate, red-coloured (smaller in ssp. *zhuangiana*). Upper petal narrowly crested, with an upwardly curved spur about 7 mm long with a nectary 3 mm long. Inner petals 6 mm long. Lower petal gibbous at base, but not constricted at the middle (with a minute cornute spur in ssp. *zhuangiana*). Style 1—1.5 mm long. Stigma with 4 stipitate apical papillae. Fruit up to 15-seeded, $7-9 \times 2$ mm, obovoid. Seeds about 1.1 mm long, smooth.

ssp. *rubrisepala*: Only known from the type locality.

ssp. *zhuangiana* Liden, ssp. nov

C. longipes var. *megalantha* Zhuang, Acta Bot. Yunnanica 13: 17. 1991.

Type: Mira La $29^{\circ} 30'$, $94^{\circ} 09'$, 3,500 m 12. 8. 1938, on damp grassy stream banks Ludlow & Sherriff 6123 (BM-holo).

Differs from ssp. *rubrisepala* in the much smaller sepals, and the minute spur at base of the lower petal (Fig. 4); in ssp. *rubrisepala* the lower sepal is gibbous, but not spurred. Similar spurs are sometimes found also in *C. gracillima* and (very rarely) in *C. casimiriana* ssp. *brachycarpa*.

Damp, grassy stream banks 3000—3500 m, August.

Specimens examined: Xizang: Mira La, Ludlow & Sherriff 6123 (BM-holo); puchu, Gyamda Chu. $29^{\circ} 26'$ $94^{\circ} 21'$, Ludlow, Sherriff & Taylor 6805 (BM).

C. gouldii Liden, Rhedea 1: 34. 1991.

Type: Bhutan, Timphu district (?), Tsaliinape to Pumo-La, 2350—3660 m 8. 7. 1938, Gould 922 (K-holo). (Fig. 4.)

Probably usually perennial with a few swollen adventitious roots present at base. Stems slender, erect, sparingly leafy, 30—50 cm long, branched from the base and above. Lower leaf very long-stalked, uppermost shortly stalked; lamina trinerviate with leaflets deeply divided into obovate-obtuse lobes. Racemes 5—15-flowered, rather dense. Bracts small; lower ones leaflike, twice to three times cut into threes; upper ones simply trifid or dentate, shorter than the 5—13 mm long pedicels. Sepals $2-2.5 \times 1.5-2$ mm, deeply fimbriat-dentate. Upper petals shortly acuminate, narrowly to rather broadly cristate with crest tapering towards the apex and long-decurrent on the slender upwardly curved spur, which is 7—9 mm long with nectary half as long or slightly more. Lower petal narrowly crested, with a short narrowly base widening into a broad acute to shortly acuminate limb, without a basal pouch. Inner petals 6 mm long, slightly tipped with blackish purple, except for the median dorsal wings. Style 2 mm long. Stigma with four stipitate apical papillae. Capsule probably obovoid. Seeds unknown.

A revision of *Corydalis* sect. *Fumarioides*

Specimens examined: Bhutan : Timphu district: Gidakom valley at the slope leading to Chimilamtso, 3400 m, rock crevices in open fir forest, 26. 8. 1989. J. R. I. Wood 7122.(E, GB).

C. khasiana Liden, Rheedia 1: 34. 1991.

Types: India, Khasia hills, 5000–6000 feet, Hooker fil. & Thomson s. n. (K-holo, E, S, UPS).

Annual or probably often perennial with one to several stems arising from a short rootstock with a few fleshy roots. Stem slender, diffusely branched 20–50 cm long. Leaves green above, strongly glaucous beneath, tri-ternate to tri-pinnate with leaflets more or less divided into obovate, acute to obtuse, usually mucronate lobes. Lower leaves long-stalked; upper ones subsessile. Racemes 5–10-flowered. Bracts divided, lower ones two to three times cut into threes; upper ones tri-fid or rarely entire, equalling or shorter than the strongly recurved 7–14 mm long fruiting pedicels. Sepals 1.5–2 mm, dentate. Corolla yellow, usually with the tip of the inner petals dark purple, except for the dorsal wings. Spur of upper petal triangular, 5–7 mm long with nectary about half as long. Lower petal gibbous at base. Inner petals 7 mm long. Capsule ovoid, 8–10 mm long. Seeds 1.4–1.6 mm. Style 2 mm long. Stigma with four stipitate papillae.

"In ditches amongst thickets and rank herbage growing on open banks" 1600–2700 m.

Rather similar to *C. filiformis* but leaves and bracts more divided and stigma with only four papillae.

Specimens examined: India: Khasia hills: Clarke 7300 (K), 44266 (BM), Griffith 149 (S, C), Kingdon Ward 18673 (BM). Bhutan: Punakha district near Phubjikah village, 2700 m "slender annual in open bog", 24. 9. 1989, 2700 m. J. R. I. Wood 6712 (E)-deviates from *C. khasiana* in the slightly divided bracts and the straight lower petal, but the material is poor.

C. aconitiflora Liden, Rheedia 1: 34. 1991.

Typus: Burma, Mt Victoria, turf slopes, 2600–2900 m, "a weak straggling plant, often more or less prostrate, flowers orange" Kingdon Ward 22798 (GB-holo; BM-iso). (Fig. 3. Map 4)

Basal parts unknown. Stem slender, diffusely branched, 50–75 cm long (?). Leaves bipinnate to biternate with leaflets deeply divided into obovate-obtuse, mucronate lobes. Racemes lax, 5–10-flowered. Bracts small, 4 mm long, clavate, entire or sometimes slightly dentate at apex, much shorter than the 10–20 mm long pedicels that are arcuate-recurved in fruit. Flowers

Magnus Liden

orange with a purplish suffusion on the spur. Sepals up to 1 mm, circundentate. Corolla broad, acute at apex, with crest decurrent on spur and gradually attenuate towards the apex. Spur short, broad, blunt, 5–7 mm long. Nectary 1.5 mm long. Lower petal with short, broad, strongly saccate claw and broadly elliptic-acute to shortly acuminate blade. Inner petals 8–9 mm long, tipped with dark purple. Stigma with four apical stipitate papillae. Fruit ovoid, 7.5–9 × 3.3–5 mm with 2–3 mm long style, 7–9 seeded. Seeds 1.8 mm in diameter, smooth, with short elaiosome.

M. Naslund & F. Kingdon Ward (S China Hills, 2600–3000 m, 1956), cultivated in the Bergius Botanic Garden (Stockholm), has slightly smaller flowers, but could possibly emanate from the same locality.

Series Pinnata Liden, *Rhedea* 1: 32. 1991.

Type: species: *C. lathyroides* Prain.

The sole representative, *C. lathyroides* is habitually very different from the other species of the section. The thin nectary and the very long, patent elaiosome are also distinctive. The petals and stigma are, however, rather similar to those of the series *Himalayanae*.

C. lathyroides Prain, *J. Asiatic Soc. Beng.* II, 65 (2): 23. 1896.

Type: Kumaon, Ralam valley, 3050–3350, on rocks, *Duthie* 7208 (K).

C. brevicalcarata Ludlow, *Bull. Brit. Mus. (Nat. Hist.) Bot.* 18 (6): 532. 1989.

Type: W. Nepal, Bhurchula Lekh S of Jumla, 14. 7. 1952 *Polunin, Sykes & Williams* 4684 (BM-holo, E).

(Fig. 5 Map 2).

Delicate perennial. Stems one to few, 10–20 cm, from a narrow cylindric rootstock, leafless at base except for a minute scale, sparingly leafy above. Leaves narrowly oblong, pinnate; lower one long-petiolate, uppermost sessile. Leaflets in 3–5 (–6) pairs, entire or usually divided into 2–5 obovate-obtuse segments. Racemes terminal and axillary from the upper leaves, 4–12-flowered, lax. Bracts 3–4 mm, entire, much shorter than the slender erecto-patent pedicels which attain 5–15 mm during anthesis, 15–20 mm in fruiting stage. Sepals 0.75–1.5 mm, shallowly dentate. Corolla 8–10 (–12) mm, not or very narrowly cristate. Upper petal acute with a short spur 3.5–6 mm long, slightly curved upwards. Lower petal 7 mm long, acute, without a basal pouch. Inner petals 6–7 mm long. Nectary very slender, 2/3 as long as spur. Style 2 mm long. Stigma with 4, stalked apical papillae. Fruit 6–8 × 1.5–2 mm, narrowly ovoid, to 15-seeded. Seeds small, 0.7 mm long, with very long elaiosomes, glossy, biseriate.

A revision of *Corydalis* sect. *Fumarioides*

Wet cliff ledges and shady rocks in moss; 2500—3900 m. Flowering June to September.

Specimens examined: Kumaon: Ralam valley, *Duthie* 2708 (K); Bogudnar, *Koelz* s. n. (RAW). Sikkim: Zemu valley, *Smith & Cave* 1635 (K); Tosa, *W. W. Smith* 3941 (E?). Bhutan: Thita Tso, *Ludlow, Sherriff & Hicks* 17094 (A, E, K, BM); Timphu, *Cooper* 2578 (E).

Series Angustiflorae Liden, *Rhedea* 1: 32: 1991.

Type: species: *C. pseudodrakeana* Liden

C. pseudodrakeana Liden, *Rhedea* 1: 32. 1991.

Typus: SE Tibet, Kongbo province, valley above Tripe, 29° 37' N, 94° 56' E, 10000 feet, 20. 7. 1938, in deep shade of "Q. ilex" forest, perianth segments yellow with median green area and green at apex. *Ludlow, Sherriff & Taylor* 5401 (BM).

C. drakeana var. *tibetica* C. Y. Wu & H. Zhuang, *Fl. Xiz.* 2: 302. 1985.

Type: Xizang: Mainling, *Q. X. exp.* 75811 (KUN).

(Fig. 5, Map 2.)

Basal parts unknown. Stems slender, but rather stiff, straight to somewhat zig zagy. Leaves long-stalked, sheathing at base; lamina triangular, three to four times ternatisect (or sub-bipinnate with 3 pinnae, 1—3 pinnulae and ternatisect leaflets); ultimate leaflets entire to deeply divided into 2—4 obovate lobes. Racemes long and lax, ± secund, ca 10-flowered. Middle and upper bracts entire, small; the lowermost often dentate or sometimes much divided, ± papillose on the veins beneath. Pedicels recurved in fruit, 3—4 mm long. Sepals minute. Corolla almost ecrystate, yellow with greenish markings, 12—14 mm long including a 7—9 mm long narrow spur. Inner petals 8 mm long. Fruits linear, 11—13-seeded, 14—16 × 1.5 mm. Mature seeds unknown.

SE Tibet, 3200—3600m.

This species bears a superficial resemblance to *C. drakeana* Prain (= *C. eccremocarpa* W. W. Smith) in the narrow and lax inflorescence, small entire bracts, and short recurved pedicels. It is not closely related to the other species, and should perhaps be put in a separate subsection.

Specimens examined: Xizang: Jiage, *Xizang Drug. Herb. Exp.* 3817 (PE); Mainling, *Q-X-exp* 75811 (KUN); 29° 37' N, 94° 56' E, *Ludlow, Sherriff & Taylor* 5401, (BM).

Magnus Liden

Revised key to the species

0. Flowers purple..... *C. zhongdianensis*
0. Flowers yellow..... 1.
1. With stout rootstock; stigma usually lacking geminate papillae (subsect. *Radicosa*)..... 2.
1. With slender taproots, with or without a few fleshy lateral roots; stigma with a pair of geminate papillae (subsect. *Fumarioides*)..... 6.
2. Ultimate leaflobes lanceolate-acute; fruit obovoid... *C. drepanantha*
2. Ultimate leaflobes obovate-obtuse to flabellate; fruit narrowly obovoid to narrowly oblong..... 3.
3. Ultimate leaflobes obovate-obtuse upper bracts entire... 4.
3. Ultimate leaflobes flabellate; bracts deeply divided into narrow segments..... *C. pseudotongolensis*
4. Inner petals pale; fruit oblong or linear; stigma with 6 papillae 5.
4. Inner petals tipped with dark purple; fruit narrowly obovoid; stigma with 4 papillae; *C. diffusa*
5. Crest of upper petal broad, entire, truncate at apex; spur shorter than limb..... *C. cavei*
5. Crest of upper petal often irregularly sinuate, narrowed at apex; spur equaling or longer than limb..... *C. crispa*
6. Leaves oblong, simply pinnate; seeds very small with prominent elaiosomes..... *C. lathyroides*
6. Leaves triangular to triangular ovate, much divided; seeds with short inconspicuous elaiosomes..... 7.
7. Seeds tuberculate..... 8.
7. Seeds smooth..... 9.
8. Crest of outer petals entire; sepals less than 1 mm, deeply divided in 2—5 lobes..... *C. tongolensis*
8. Crest of upper petal irregularly sinuate-dentate; sepals 1.5—2 mm, fimbriate..... *C. yui*
9. Crest of lower petal clearly overtopping the apex (China, Siberia)..... 10.
9. Crest of lower petal narrow or absent (Himalaya and SW China) 13.
10. Stigma with two apical papillae; outer petals rostellate; most bracts entire, flowers cream..... *C. rostellata*
10. Stigma with four apical papillae; flowers usually yellow..... 11.

A revision of *Corydalis* sect. *Fumariooides*

11. Lower petal without a pouch; fruit oblong.....12.
11. Lower petal with a distinct pouch; fruit obovoid.....*C. sibirica*
12. Middle and upper bracts entire; plants 10–40 cm; capsules 10–12 × 1.5–2 mm (Siberia).....*C. impatiens*
12. Bracts small, but much divided; plants 30–80 cm; capsule 8 × 1 mm (W China).....*C. pseudoimpatiens*
13. Pedicels 3–4 mm long: outer petals almost ecristate; spur very narrow.....*C. pseudodrakeana*
13. Pedicels 5–20 mm long; upper petal with a distinct crest (series *Himalayanae*).....14.
14. Nectarium almost half as long as spur.....15.
14. Nectarium less than one fourth as long as spur.....22.
15. Lower petal with a distinct gibbosity or a short spur at base.....16.
15. Lower petal straight, not gibbous at base.....19.
16. Sepals orbicular, 2–3 mm, finely dentate.....17.
16. Sepals 0.3–1.5 mm.....18.
17. Outer petals with a minute black dot at the very apex; stigma with four apical papillae.....*C. rubrisepala*
17. Outer petals not black-tipped; stigma with six apical papillae.....*C. filiformis*
18. Lower petal with a short broad spur at base; sepals minute (Sikkim).....*C. changuensis*
18. Lower petal saccate at base, but not spurred; sepals 1–1.5 mm (Khasia hills, Bhutan).....*C. khasiana*
19. Sepals 2–3 mm, deeply dentate to fimbriate.....20.
19. Sepals minute.....21.
20. sepals ovate; inner petals tipped blackish purple (Bhutan).....*C. gouldii*
20. Sepals orbicular; inner petals pale at tip (W Nepal)....*C. calycina*
21. Fruit uniseriate to biseriate; with thick adventitious roots; upper bracts entire; seeds 1 mm.....*C. casimiriana*
21. Fruit always biseriate; annual with thin taproot; most bracts divided; seeds 0.8 mm.....*C. gracillima*
22. Outer petals acuminate; inner petals pale at tip; stigma with 6 prominent apical papillae*C. longipes*
22. Outer petals acute; inner petals tipped with blackish purple; stigma with 4 apical papillae.....23.
23. Most or all bracts divided; lower petal 5–6 mm; seeds 1.2 mm in diameter.....*C. pseudolongipes*
23. Bracts entire; lower petal 8 mm long; seeds 1.8 mm in diameter.....*C. aconitiflora*

Magnus Liden**Acknowledgements**

I am deeply indebted to all herbarium curators who have made this study possible, to Royal Botanic Garden, Edinburgh that housed me during much of the revisionary work, and to friends and colleagues at the Department of Botany in Kunming, who had to endure my never-ending queries about localities.

Literature cited

- Handel-Mazzetti, H. R. 1931. *Symbolae Sinicae* VII.
- Jafri, S. M. H. 1974. Fumariaceae. In: Jafri & al. *Flora of West Pakistan*. Rawalpindi.
- Liden, M. 1989. *Corydalis* (Papaveraceae: Fumarioideae) in Nepal. *Bull. Br. Mus. nat. Hist. (Bot.)* 18: 479-538.
- Liden, M. 1991. A revision of *Corydalis* sect *Fumarioides* sect. nov. part I. *Rheedia* 1: 29-35.
- Long, D. G. 1984. Notes relating to the flora of Bhutan IX. *Notes R B G. Edinb.* 42: 87-106.
- Zhuang Xuan 1991. New species of genus *Corydalis* sect *Ramoso-sibiricae* from China. *Acta Botanica Yunnanica* 13:17